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ELECTRONIC SPREADSHEET (ADVANCED)

Class X , UNIT 1: Electronic Spreadsheet (Advanced) (IT #402)

Session 1: ANALYSE DATA USING SCENARIOS AND GOAL SEEK.

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ELECTRONIC SPREADSHEET (ADVANCED)

- SESSION 1: ANALYSE DATA USING SCENARIOS AND GOAL SEEK
- SESSION 2: LINK DATA AND SPREADSHEETS
- SESSION 3: SHARE AND REVIEW A SPREADSHEET
- SESSION 4: CREATE AND USE MACROS IN SPREADSHEET

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Learning Outcome of this session

- The students will be able to:
  - Explain consolidating data
  - Demonstrate subtotal tool
  - Explain what-if scenarios
  - Identify what-if Analysis tool

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Introduction

- Analyzing data is the process to extract useful information for making effective decisions. There are various data analysis software such as Calc, Excel and Python that are used to retrieve, correlate, explore and visualize data to identify patterns, trends and relationships. LibreOffice Calc includes several tools used to manipulate the data in the spreadsheet.

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Consolidating data

Consolidate function is used to combine information from multiple sheets of the spreadsheet into one place to summarize the information. It is used to view and compare variety of data in a single spreadsheet for identifying trends and relationships. Steps to consolidate the data are as follows:

1. Open the worksheet that contains the cell ranges to be consolidated.
2. Choose the Consolidate option under the Data menu as shown in Figure2.1. The Consolidate dialog box is shown in Figure 2.2.

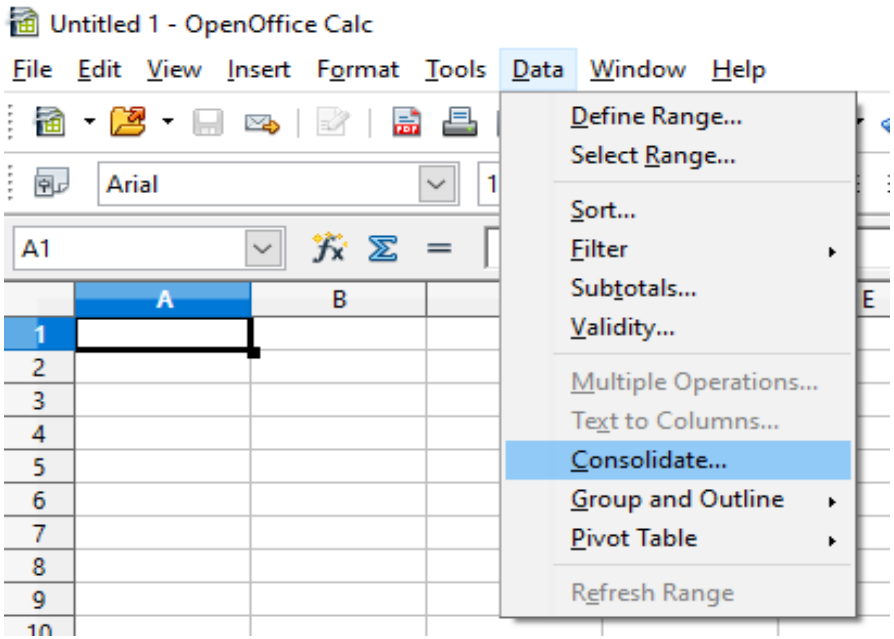

Figure 2.1: Consolidate option under Data Menu

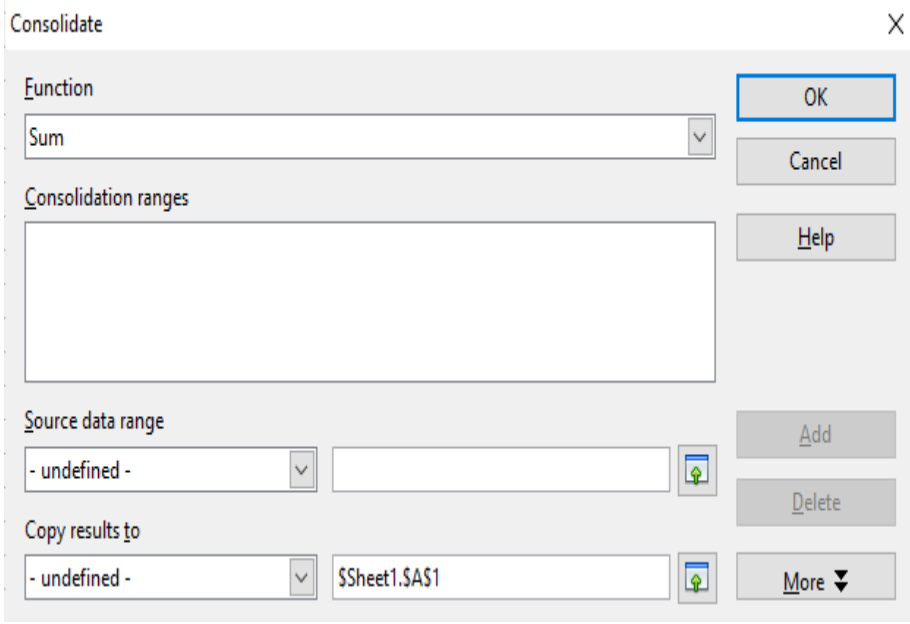

Figure 2.2: Consolidate Dialog box defining the data to be consolidated

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Consolidating data

3. If the Source data range list contains named ranges, you can select a source cell range to consolidate with other areas.

   If the source range is not named, click in the field to the right and either type a reference for the first source data range or use the mouse to select the range on the sheet. (You may need to move the Consolidate dialog to reach the required cells.)
4. Click **Add**. The selected range now appears on the Consolidation ranges list.
5. Select additional ranges and click **Add** after each selection.
6. Specify where you want to display the result by selecting a target range from the Copy results to box.

   If the target range is not named, click in the field next to **Copy results to** and enter the reference of the target range or select the range using the mouse or position the cursor in the top left cell of the target range.
7. Select a function from the Function list. The function specifies how the values of the consolidation ranges are linked. The Sum function is the default setting.

   Most of the available functions are statistical (such as AVERAGE, MIN, MAX, STDEV), and the tool is most useful when you are working with the same data over and over.

Consolidating data

8. Optionally click **More** in the Consolidate dialog to display additional settings.

   Select **Link to source data** to insert the formulas. This generates the results in the target range instead of the actual results. If you link the data, any values modified in the source range are automatically updated in the target range. The corresponding cell references in the target range are inserted in consecutive rows, which are automatically ordered and then hidden from view. Only the final result, based on the selected function, is displayed.

   Under **Consolidate by** setting, select either *Row labels or Column labels,* if the cells of the source data range are not to be consolidated corresponding to the identical position of the cell in the range, but instead according to a matching row label or column label. To consolidate by row labels or column labels, the label must be contained in the selected source ranges. The text in the labels must be identical, so that rows or columns can be accurately matched. If the row or column label does not match any that exist in the target range, it will be appended as a new row or column.

9. Click OK to consolidate the ranges.

10. If you are continually working with the same range, then you probably want to use Data > Define Range to give it a name. Define Range option is available under the Data Menu.

    The data from the consolidation ranges and target range are saved when you save the worksheet. If you later open a worksheet in which consolidation has been defined, this data will again be available.

Creating Subtotals

SUBTOTAL is a function listed under the Mathematical category when you use the Function Wizard (**Insert > Function**). Because of its usefulness, the function has a graphical interface. It is accessible from Data menu as shown in Figure2.3

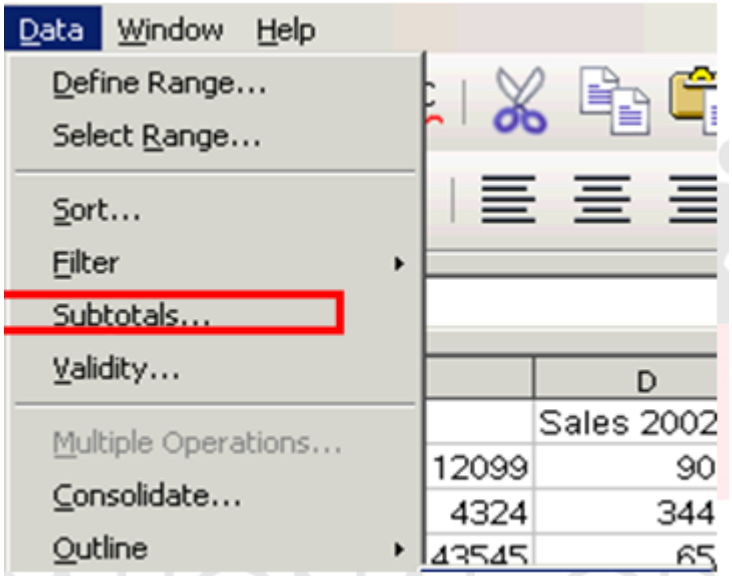

Figure 2.3: Subtotal option under Data Menu

SUBTOTAL, totals/adds data arranged in an array—that is, a group of cells with labels for columns and/or rows. Using the Subtotals dialog, you can select arrays, and then choose a statistical function to apply to them. For efficiency, you can choose up to three groups of arrays to which to apply a function. When you click **OK**, Calc adds subtotals and grand totals to the selected arrays, using the Result and Result2 cell styles for them.

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Creating Subtotals

Steps to insert subtotal values into a sheet:

1. Ensure that the columns have labels.
2. Select the range of cells that you want to calculate subtotals for, and then choose **Data -> Subtotals**.
3. In the Subtotals dialog (Figure 2.4), in the **Group by** box, select the column that you want to add the subtotals to. If the contents of the selected column change, the subtotals are automatically recalculated.
4. In the **Calculate subtotals** for box, select the columns containing the values that you want to subtotal.
5. In the **Use function** box, select the function that you want to use to calculate the subtotals.
6. Click **OK**.

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Creating Subtotals

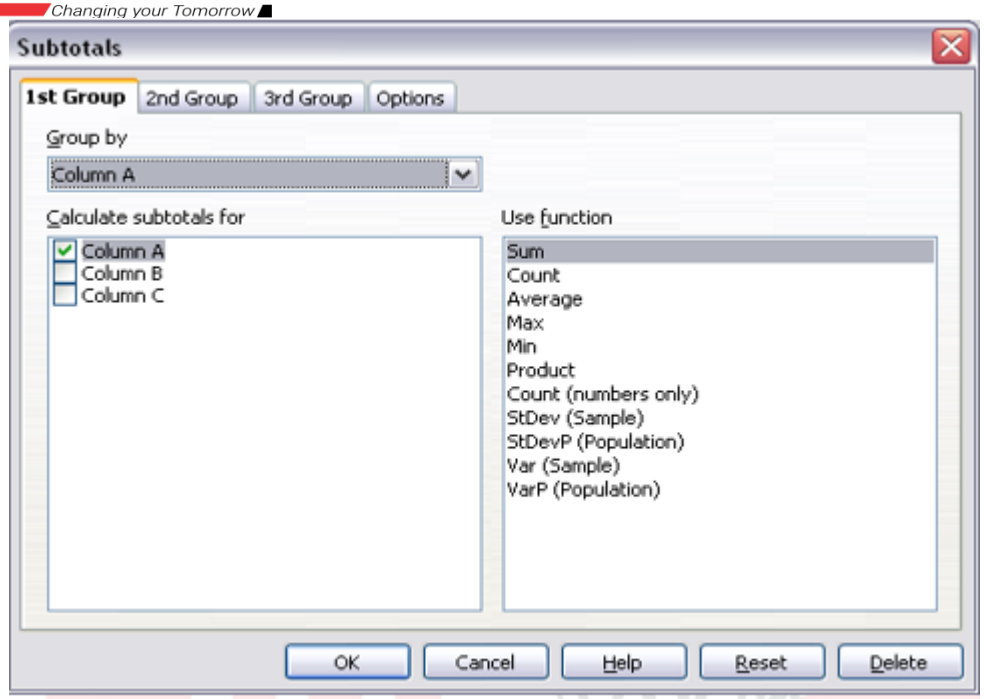

Figure 2.4: Setting up subtotals

If you use more than one group, then you can also arrange the subtotals according to choices made on the dialog's Options page (Figure 2.5), including ascending and descending order or using one of the predefined custom sorts defined under Tools menu as **Tools-> Options-> OpenOffice.org Calc-> Sort Lists**.

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Creating Subtotals

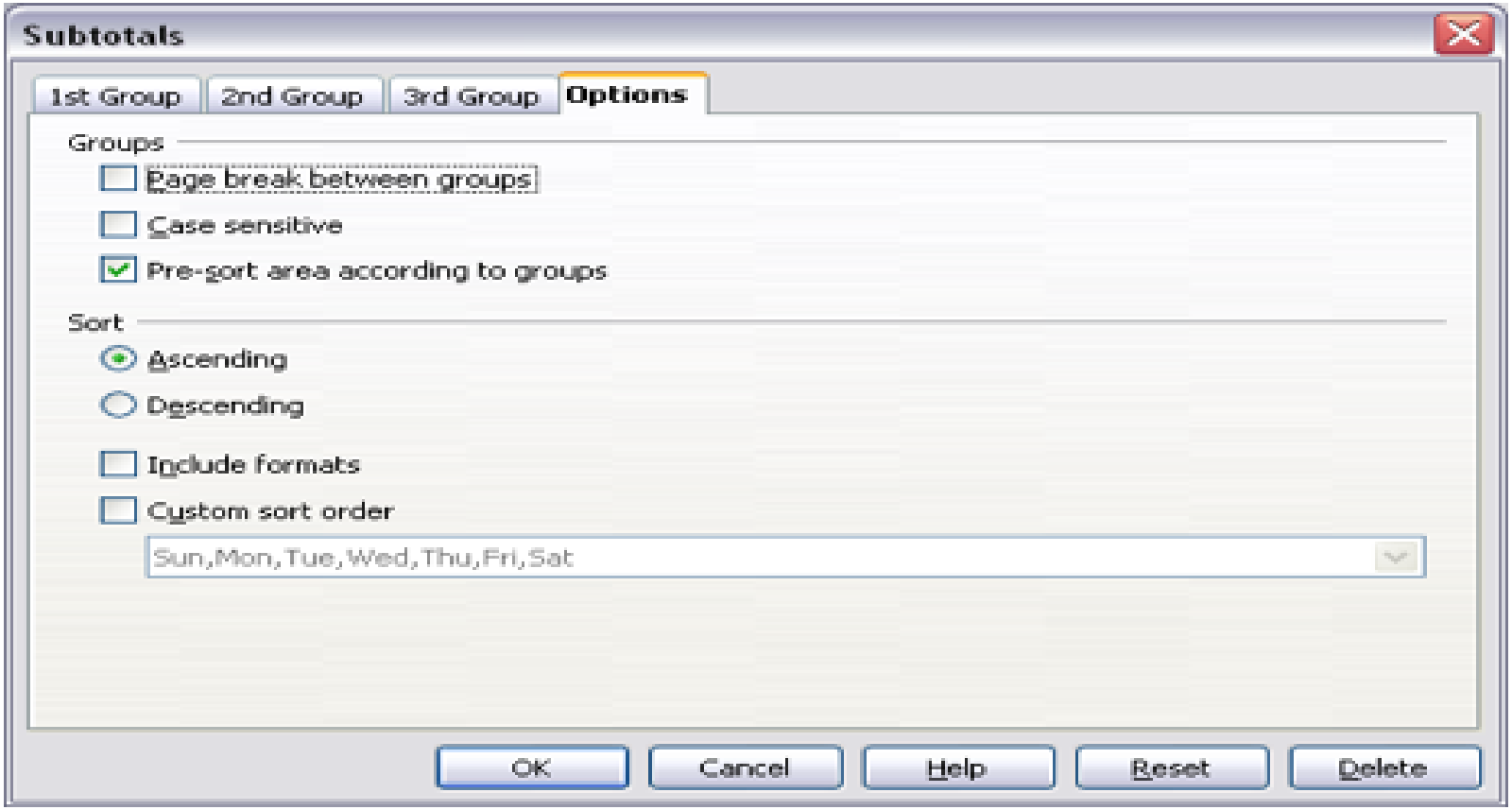

Figure 2.5: Choosing options for subtotals

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Using "What If" Scenarios

- Scenarios are a tool to test "what-if" questions. Each scenario is named, and can be edited and formatted separately. When you print the spreadsheet, only the content of the currently active scenario is printed.
- A scenario is essentially a saved set of cell values for your calculations. You can easily switch between these sets using the Navigator or a drop-down list which can be shown beside the changing cells. For example, if you wanted to calculate the effect of different interest rates on an investment, you could add a scenario for each interest rate, and quickly view the results. Formulas that rely on the values changed by your scenario are updated when the scenario is opened. If all your sources of income used scenarios, you could efficiently build a complex model of your possible income.

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Creating Scenarios

Use Scenarios option under Tools menu to enter variable contents—scenarios—in the same cell. To create a scenario:

1. Select the cells that contain the values that will change between scenarios. To select multiple cells, hold down the Ctrl key as you click each cell.
2. Choose **Tools > Scenarios**.
3. On the Create Scenario dialog (Figure 2.6), enter a name for the new scenario. It's best to use a name that clearly identifies the scenario, not the default name as shown in the illustration. This name is displayed in the Navigator and on the title bar of the scenario on the sheet itself.
4. Optionally add some information to the Comment box. The example shows the default comment. This information is displayed in the Navigator when you click the Scenarios icon and select the desired scenario.
5. Optionally select or deselect the options in the Settings section. See below for more information about these options.
6. Click **OK** to close the dialog. The new scenario is automatically activated. You can create several scenarios for any given range of cells.

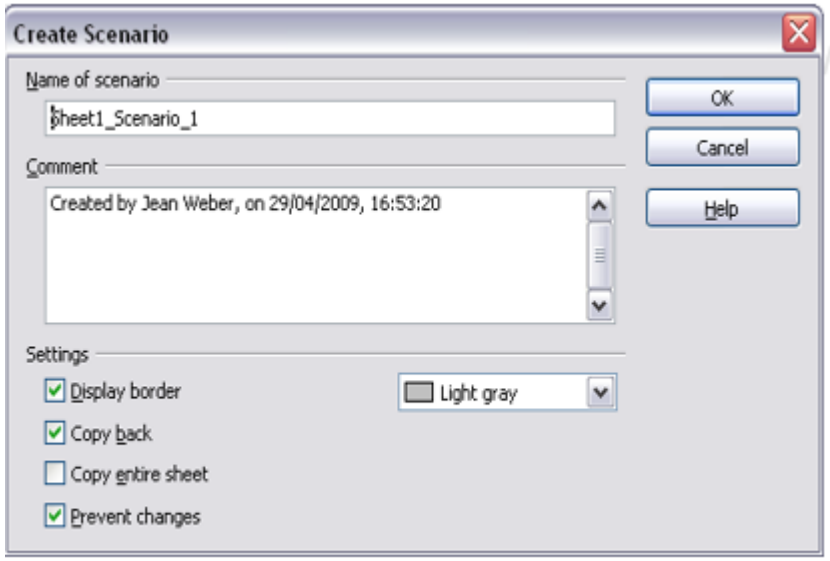

Figure 2.6: Creating a scenario

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Using Goal Seek

Usually, you run a formula to calculate a result based upon existing values. By contrast, using Goal Seek option under Tools menu, you can discover what values will produce the result that you want.

To take a simple example, imagine that the Chief Financial Officer of a company is developing sales projections for each quarter of the forthcoming year. She knows what the company's total income must be for the year to satisfy stockholders. She also has a good idea of the company's income in the first three quarters, because of the contracts that are already signed. For the fourth quarter, however, no definite income is available. So how much must the company earn in Q4 to reach its goal? The CFO can enter the projected earnings for each of the other three quarters along with a formula that totals all four quarters. Then she runs a goal seek on the empty cell for Q4 sales, and receives her answer.

Other uses of goal seek may be more complicated, but the method remains the same. Only one argument can be altered in a single goal seek.

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Goal Seek example

To calculate annual interest (I), create a table with the values for the capital (C), number of years (n), and interest rate (r). The formula is I = C*n*r.

Let us assume that the interest rate r of 7.5% and the number of years n (1) will remain constant. However, you want to know how much the investment capital C would have to be modified in order to attain a particular return I. For this example, calculate how much capital C would be required if you want an annual return of $15,000.

Enter each of the values mentioned above into adjacent cells (for Capital C, an arbitrary value like $100,000 or it can be left blank; for number of years n, 1; for interest rate r, 7.5%). Enter the formula to calculate the interest I in another cell. Instead of C, n, and r

use the reference to the cell with the corresponding value. In our example, this would be

=B1*B2*B3.

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Goal Seek example

1. Place the cursor in the formula cell (B4), and choose Tools > Goal Seek.
2. On the Goal Seek dialog, the correct cell is already entered in the Formula cell field.
3. Place the cursor in the Variable cell field. In the sheet, click in the cell that contains the value to be changed, in this example it is B1.
4. Enter the desired result of the formula in the Target value field. In this example, the value is 15000. The figure below shows the cells and fields.
5. Click OK. A dialog appears informing you that the Goal Seek was successful. Click Yes to enter the result in the cell with the variable value. The result is shown below.

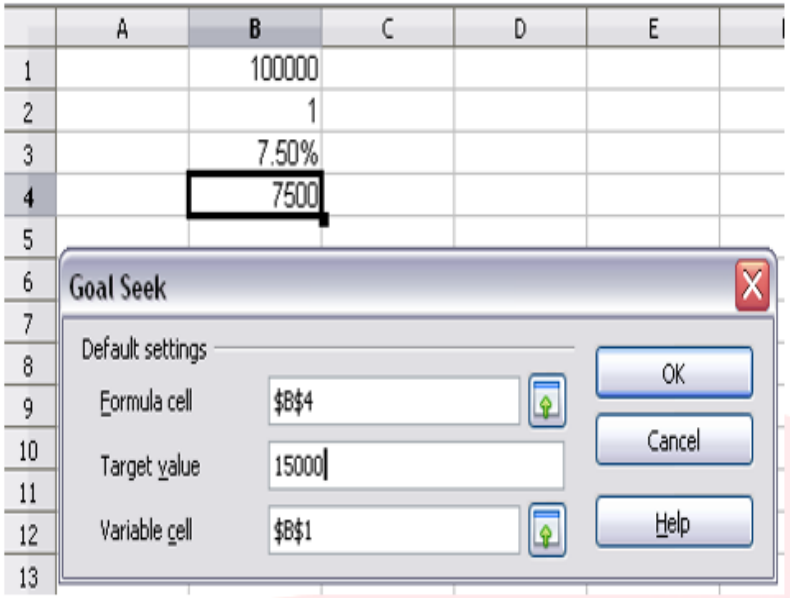

Figure 2.7: Example setup for goal seek

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Using the Solver

- **Solver option** under Tools menu amounts to a more elaborate form of Goal Seek. The difference is that the Solver deals with equations with multiple unknown variables. It is specifically designed to minimize or maximize the result according to a set of rules that you define.
- Each of these rules sets up whether an argument in the formula should be greater than, lesser than, or equal to the value you enter. If you want the argument to remain unchanged, you enter a rule that the cell that contains it should be equal to its current entry. For arguments that you would like to change, you need to add two rules to define a range of possible values: the limiting conditions. For example, you can set the constraint that one of the variables or cells must not be bigger than another variable, or not bigger than a given value. You can also define the constraint that one or more variables must be integers (values without decimals), or binary values (where only 0 and 1 are allowed).
- Once you have finished setting up the rules, you can adjust the argument and the results by clicking the **Solve** button.

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Solver example

Let's say you have $10,000 that you want to invest in two mutual funds for one year. Fund X is a low risk fund with 8% interest rate and Fund Y is a higher risk fund with 12% interest rate. How much money should be invested in each fund to earn a total interest of $1000?

- To find the answer using Solver:
  1. Enter labels and data:
     - Row labels: Fund X, Fund Y, and total, in cells A2 thru A4.
     - Column labels: interest earned, amount invested, interest rate, and time period, in cells B1 thru E1.
     - Interest rates: 8 and 12, in cells D2 and D3.
     - Time period: 1, in cells E2 and E3.
     - Total amount invested: 10000, in cell C4.
  2. Enter an arbitrary value (0 or leave blank) in cell C2 as amount invested in Fund X.
  3. Enter the formulae given below:
     - In cell C3, enter the formula C4-C2 (total amount - amount invested in Fund X) as the amount invested in Fund Y.
     - In cells B2 and B3, enter the formula for calculating the interest earned (see below).
     - In cell B4, enter the formula B2+B3 as the total interest earned.

Solver example

B3 | f(x) | Σ | = | =C3*D3/100*E3

	A	B	C	D	E	F
1		interest earned	amount invested	interest rate	time period	
2	Fund X	0	0	8	1	
3	Fund Y	1200	10000	12	1	
4	total	1200	10000			
5						
6						

Figure2.9: Example setup for solver

4. Choose Tools -> Solver.

   The solver dialog opens as shown in Figure 2.10.

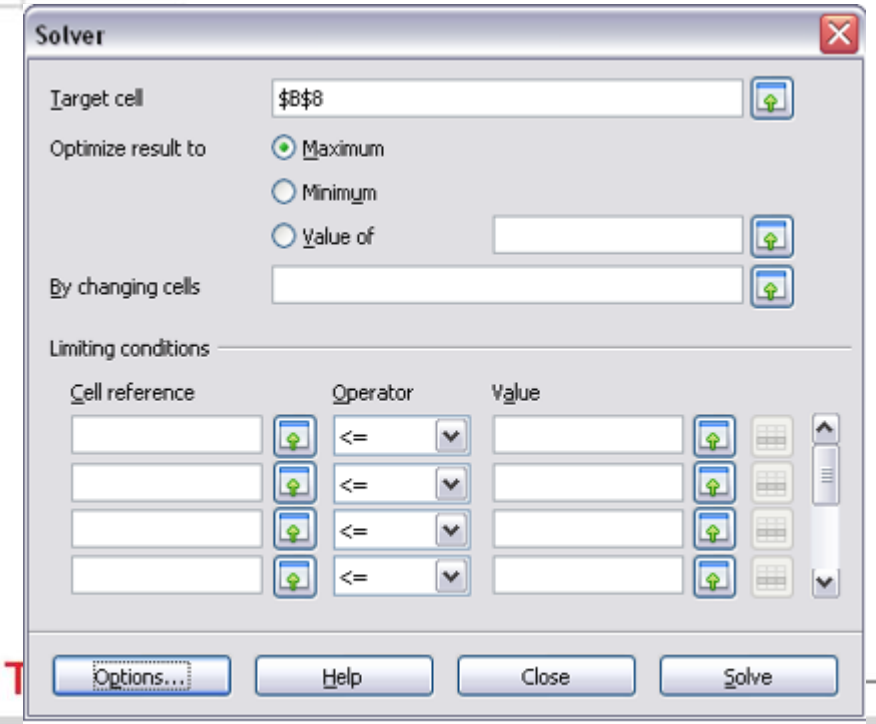

Figure2.10: The Solver dialog

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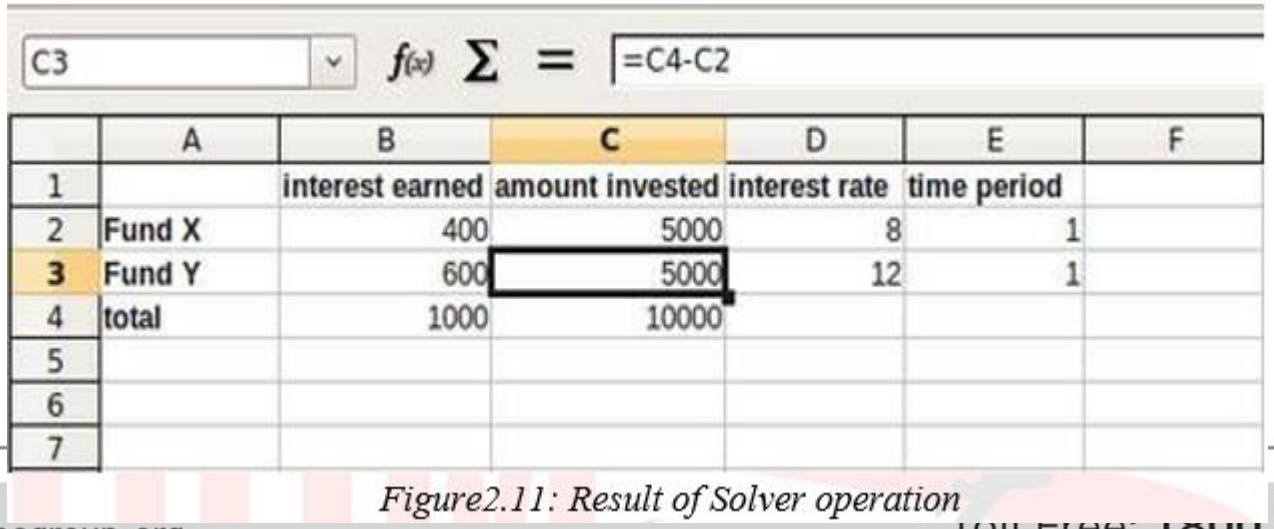
Solver example

5. Click in the Target cell field. In the sheet, click in the cell that contains the target value. In this example it is cell B4 containing total interest value.
6. Select Value of and enter 1000 in the field next to it. In this example, the target cell value is 1000 because your target is a total interest earned of $1000. Select Maximum or Minimum if the target cell value needs to be one of those extremes.
7. Click in the By changing cells field and click on cell C2 in the sheet. In this example, you need to find the amount invested in Fund X (cell C2).
8. Enter limiting conditions for the variables by selecting the Cell reference, Operator and Value fields. In this example, the amount invested in Fund X (cell C2) should not be greater than the total amount available (cell C4) and should not be less than 0.
9. Click OK. A dialog appears informing you that the Solving successfully finished. Click Keep Result to enter the result in the cell with the variable value. The result is shown below.



	A	B	C	D	E	F
1		interest earned	amount invested	interest rate	time period	
2	Fund X	400	5000	8	1	
3	Fund Y	600	5000	12	1	
4	total	1000	10000			
5						
6						
7						

Figure2.11: Result of Solver operation

Home Assignment

- **PRACTICAL ACTIVITY**

1. A student is planning her goals about the marks she should attain in the forthcoming Semester 4 examinations in order to achieve a distinction (75%). Assuming that examination of each subject is for 100 marks, her marks of the previous semesters are given as under.

	Subject 1	Subject 2	Subjec3	Subject 4
Semester 1	82	67	53	87
Semester 2	88	78	76	69
Semester 3	89	85	91	67

Find out how many marks should she obtain in 4^{th} semester to secure distinction.

Home Assignment

2. A business owner wants to decide if he should try to increase the sales a product or price of an existing product in order to increase the profit by 10%.

Current Sales	82
Cost per Unit	75
Profit per unit	12

The owner believes that he can either increase sales by 5 units without incurring additional costs while the price can be increased by Rs 8 without affecting the sales.

3. The current profit situation of a business owner is as follows.

Current Sales	82
Cost per Unit	75
Profit per unit	12

Using the scenario manager, find the effect of in the new profit in case of the following situations.

a) Sales = 70 and cost = 80
b) Sales = 90 and cost = 72
c) Sales = 85 and cost = 80
d) Sales = 65 and cost = 80

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